

NON-PUBLIC?: N
ACCESSION #: 9002060019
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Grand Gulf Nuclear Station - Unit 1 PAGE: 1 OF 06

DOCKET NUMBER: 05000416

TITLE: Malfunction Telemetry Causes Loss of Plant Service Water and
Manual Reactor Scram

EVENT DATE: 12/30/89 LER #: 89-019-00 REPORT DATE: 01/29/90

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 083

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR
SECTION:

50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:

NAME: Riley Ruffin / Licensing Specialist TELEPHONE: (601) 437-2167

COMPONENT FAILURE DESCRIPTION:

CAUSE: SYSTEM: COMPONENT: MANUFACTURER:

REPORTABLE NPRDS:

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On December 30, 1989, a total loss of Plant Service Water (PSW) was experienced due to a loss of power to the supply wells. Reactor power was reduced by decreasing recirculation flow through the reactor core and a reactor shutdown sequence was commenced.

While reducing reactor power, the operators determined that PSW would not be readily restored and the reactor was manually scrammed. The Reactor Core Isolation Cooling (RCIC) System was initiated for reactor vessel level control. The main steam line isolation valves were closed in accordance with procedures. This action caused a high pressure scram signal and an ATWS/ARI RPT actuation. Standby Service Water (SSW) was initiated and provided cooling for the component cooling water heat exchangers and the drywell chillers. The SSW basin level dropped below the Tech. Spec. limit due to leakage of SSW into PSW. Eventually, PSW was restored and SSW basin inventory was recovered. The power loss to

the supply wells was due to a malfunction of the microwave information and control systems. Periodic microwave operational checks are being established.

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END OF ABSTRACT

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A. Reportable Occurrence

On December 30, 1989, the reactor was manually scrammed following a loss of the Plant Service Water (PSW) System (EIS code: KI). The immediate operator actions subsequently caused a scram signal due to high reactor pressure. The Reactor Protection System (RPS) actuations are reported pursuant to 10CFR50.73(a)(2)(iv).

B. Initial Conditions

The plant was operating at approximately 82.8 percent power. Operators had just completed a control rod sequence exchange and were in the process of performing a fuel preconditioning power ramp.

C. Description of Occurrence

On December 30, 1989 at 1747, a complete loss of PSW was experienced. A malfunction of the telemetric control and information systems (EIS code: JG) for the radial wells caused pumps to cycle off and on without operator action. Erroneous signals were transmitted to the incoming feeder breaker for Bus 18AG which provided power to radial wells 1 and 3. The incoming feeder breaker tripped open which deenergized Bus 18AG and caused an under voltage lockout of the associated wells. An operator was dispatched to restore power to the bus and reset the lockout. The feeder breaker could not be manually closed so the cross-tie breaker between 18AG and 28AG was closed reenergizing 18AG. Subsequently, the incoming feeder breaker for 28AG tripped open deenergizing the bus and all radial well pumps.

In order to reduce the heat load on generator auxiliaries, reactor power was reduced by reducing the recirculation flow through the core. Reactor Recirculation Flow Control Valves (FCVs) were closed to their minimum position, and a reactor shutdown sequence was commenced at 1754.

The operators determined that Psw would not be readily restored and the Shift Superintendent ordered a manual scram of the reactor. At approximately the same time, the Shift Technical Advisor (STA), monitoring the power reduction, observed the reactor operating slightly in the scram region of Technical Specification Figure 3.4.4.1-1 and confirmed that a manual scram was initiated.

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The reactor mode switch was taken to Shutdown and all rods were verified full-in. The Reactor Core Isolation Cooling (RCIC) System was manually initiated for level control. The Main Steam Line Isolation Valves (MSIVs) were closed in accordance with the Loss, of Plant Service Water Off-Normal-Event Procedure (ONEP).

Prior to establishing reactor pressure control via the Safety Relief Valve (SRVs), an automatic scram signal was received on high reactor pressure and the ATWS/ARI RPT actuated. SRVs were manually opened one at a time to control reactor vessel pressure. Suppression pool cooling was placed in service to maintain suppression pool temperature below the Tech. Spec. limit.

The Division II Standby Service Water (SSW) System (EIS code: BI) was initiated and aligned to provide cooling water for the Component Cooling Water Heat Exchangers and the Drywell Chillers. The SSW basin level decreased below the Tech. Spec. limit due to leakage into the PSW System through SSW/PSW cross-tie valves. Auxiliary Building PSW isolation valves were closed to secure the leak. Relays were pulled in buses 18AG and 28AG breaker control cabinets to allow breaker closure. The buses were reenergized and PSW was restored at 1850. This allowed SSW basin inventory to be increased to the required level and the associated limiting condition for operation was cleared at 1300 hours.

D. Apparent Cause

o Loss of Plant Service Water:

An investigation revealed the following concerning the malfunction of the radial well pump control system (Bristol-Babcock telemetry) and the radial well switchgear control system, (Computrol Multiplexor). Condensation from the ceiling of the Auxiliary Building room dripped onto a power

supply for the microwave system. The power supply provided power to the 'A' channel microwave transmitter and receiver and to the pilot signal oscillator for both the 'A' and 'B' microwave channels. When the power supply failed, all Control Room control and valid information concerning the radial wells were lost.

Loss of the pilot signal caused the Microwave System to automatically switch the operating channel from 'B' to 'A'. The squelch adjustment, on 'A' channel receiver at the switchgear house, was out of tolerance. This allowed the 'A' receiver to amplify any noise it sensed and pass it to the Radial Well Pump Control System and The Radial Well Switchgear Control System.

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The Pump control System (telemetry) interpreted the amplified noise as valid control signals and caused pumps to cycle on and off.

The Switchgear Control System (multiplexor) also interpreted the amplified noise as valid control signals and caused a continuous trip signal to Feeder Breaker 18AG. The breaker could not be closed due to the continuous trip signal.

o High pressure scram and ATWS/ARI initiation:

Closure of the MSIVs, as instructed by the Loss of PSW ONEP, caused reactor pressure to increase causing a scram signal on high pressure followed by an ATWS/ARI initiation. Initiation of the ATWS/ARI caused a reactor recirculation pump trip. This contributed to the Tech. spec. cooldown limit of 100 degrees F. per hour being exceeded at the bottom head drain. The incident concerning the cooldown rate will be discussed in a separate-Licensee Event Report (LER 90-001).

o Reduction of SSW inventory:

The decrease in SSW inventory level was due to leakage into the PSW system-through the balance of plant PSW/SSW cross-tie check valves. The check valves will be scheduled for inspection and rework during the next available PSW system outage of sufficient duration.

o Entry into the scram required region of the Power/Flow Map:

In performing the rapid power reduction, the Licensed Reactor

Operator closed the Fcvs to their minimum (0 percent) position using the fast detent on the controllers. The Integrated Operating Instruction (IOI) for Power Operations specifies that for a rapid power reduction, FCVs be closed to 10 - 15% valve position. This valve position would have prevented entry into the scram required region.

E. Supplemental Corrective Actions

o Loss of Plant Service Water:

Operator rounds have been changed to check the microwave panels inside the Auxiliary Building and at the Radial Well Switchgear House.

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A preventative maintenance task is being developed to periodically check operation of the microwave system to ensure proper equipment operation. The preventative maintenance task is expected to be issued by 04/01/90.

In addition, Engineering Evaluation Requests have been written to initiate evaluations for system enhancements such as a backup power supply for the pilot signal oscillator and a drip shield to protect the microwave power supply.

o High pressure scram and ATWS/ARI initiation:

The Loss of PSW ONEP will be evaluated and changed to maintain the MSIVs open as long as possible to allow use of the main condenser as a heat sink and minimize the use of SRVs to control reactor vessel pressure. This action will be completed by 03/01/90.

An Engineering Evaluation Requests has been written to initiate an evaluation for increasing the setpoint on the ATWS/ARI RPT high pressure signal to a pressure above the lowest relief valve setpoint. This would minimize severe cooldown transients in the reactor bottom head by allowing the reactor recirculation pumps to remain in service, mixing the cooler water in the bottom head region.

o Reduction of SSW inventory:

A standing order was issued to require operators to close PSW Auxiliary Building Isolation Valves during a total loss of PSW; thus preventing any loss of SSW inventory should the cross-tie valves leak. The PSW ONEP will be changed by 03/01/90 to incorporate the actions of the standing order. The P44F012 and P44F041, which are check valves in the PSW system, will be scheduled for inspection and rework during the next PSW system outage of sufficient duration.

o Entry into the scram required region of the power flow map:

A memorandum was issued to all Shift Superintendents reiterating the IOI requirements to stop control valve motion at 10 to 15 percent during a rapid power reduction to prevent entry into the scram-required region of the power flow-map.

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An evaluation is being performed by each Shift Superintendent to determine the adequacy of operator training in this area. if deficiencies are found, Training will be notified concerning the inadequacies.

F. Safety Assessment

The Post Trip Analysis confirmed that the safety systems functioned properly. RPS response times were satisfactory when compared to required times. The reactor water level remained at least 159 inches above the top of active fuel during the event.

An evaluation of the bottom head region of the reactor vessel, the drain piping, and critical penetrations concluded that the impact of the heatup and cooldown rates were insignificant when compared to the design usage factor and that there were no structural integrity concerns associated with continued operations. However, this evaluation was not performed until January 15, 1990. Reactor restart had commenced on December 31, 1989. The delay in recognizing the excessive cooldown rate at the bottom head drains will be discussed in LER 90-001.

The minimum required SSW basin level per Technical Specification 3.7.1.3 is at or above 130' 3" Mean Sea Level, equivalent to an indicated level of $> \text{ or } = 87$ inches. The SSW 'B' basin level decreased to an indicated minimum of approximately 68 inches before isolating the Psw system. The basin was out of Technical

Specification limits for 4.75 hours until level was restored with makeup from PSW. The SSW 'A' basin remained operable at a level above the Technical Specification limits.

During a postulated LOCA, the portion of the PSW system through which SSW inventory was lost is automatically isolated. Consequently, during an accident, there would be no concern of a loss of SSW inventory to the PSW System.

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William T. Cottle
Vice President
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January 29, 1990

U.S. Nuclear Regulatory Commission
Mail Station P1-137
Washington, D.C. 20555

Attention: Document Control Desk

Gentlemen:

SUBJECT: Grand Gulf Nuclear Station
Unit 1
Docket No. 50-416
License No. NPF-29
Malfunctioning Telemetry
Causes Loss of Plant
Service Water and Manual
Reactor Scram
LER-90/019-00
AECM-90/0026

Attached is Licensee Event Report (LER) 89-019-00 which is a final report.

Yours truly,

WTC:cg
Attachment

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